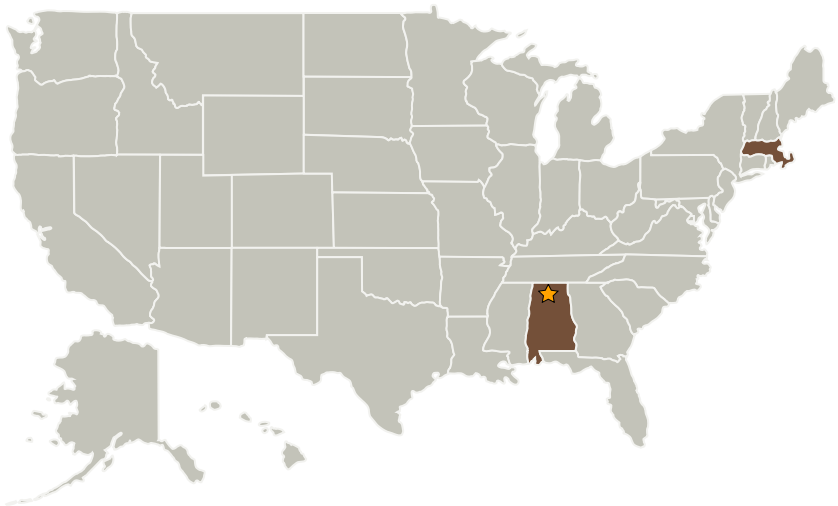
Nano-Enabled Low-Cost High-Performance UV Anti-Reflection Coatings, Phase II

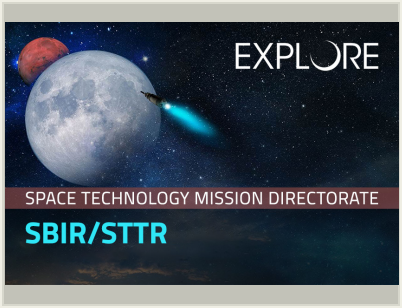
Completed Technology Project (2007 - 2009)

Project Introduction

Agiltron together with Prof. Michael Rubner's group at MIT is developing a new family of nanoporous, low refractive index coatings for next generation NASA UV anti-reflection (AR) application on large plastic optics. The initial application is intended for 2.5 m diameter PMMA Fresnel lenses which NASA anaticipates as part of the EUSO mission cosmic ray telescope. The new thin film technology combines MIT advances in nano-structured, self-assembled, low index multilayer structures with Agiltron's recently developed mist deposition process, a method for applying large area thin films at low temperature with precise layer thickness control. The proposed UV AR coatings consist of inter-connected oxide nanoparticles in the form of a 3D nanoporous network able to produce stable films with refractive indices as low as 1.1 and high transparency in the visible - UV. In Phase I of this program we successfully demonstrated AR coatings on PMMA substrates with UV reflectance less than 1% at 300-400 nm (compared to 5% for bare PMMA substrates). In Phase II, Agiltron intends to further develop the coatings to a higher technical readiness level (TRL) by improving the robustness and abrasion resistance of the films and engineering the deposition techniques to enable multilayer coatings of tuned refractive index (graded index) for broader band AR performance. By the end of Phase II, nanoporous films deposited by the mist process will possess high transparency, good environmental stability, and excellent abrasion resistance and mechanical integrity. The material can be applied conformally on large area glass and plastic substrates (polycarbonate, PMMA) using low annealing temperatures. Mist deposition is fundamentally inexpensive and may have commercial applications to the plastic optics industry for eyeglasses or cellphone camera lenses.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
AGILTRON Corporation	Supporting Organization	Industry	Woburn, Massachusetts

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Transitions

November 2007: Project Start

November 2009: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.5 Coatings